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An assessment of environmental noise pollution in Bikaner city of western Rajasthan, India

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ABSTRACT
Bikaner is the second largest city of the Thar region after Jodhpur. The present investigation was focussed of the assessment of noise level at five different sites in Bikaner city for day time as well night time during February, 2016 to April, 2016. The results of the present investigation revealed that the noise level in Bikaner city is extremely high from the prescribed level. Almost all the observations at Industrial, Commercial, Residential and even the silence zone (PBM Hospital) have shown the level of noise above its maximum permissible level. The residential site (JNV colony) was quite noiseless during night time, however in day time, noise level at JNV colony site has also found above the prescribed level. The present investigation is focused on assessment of noise level at different sites and suggests some remedial measures to mitigate the adverse effects of noise pollution.
Key words: Environmental noise pollution, maximum permissible level, silence zone

INTRODUCTION

Noise pollution is a major problem in urban environments. It is defined as any unwanted sound which gets damped into the atmosphere without regarding to the adverse effects it may have (1-3). Many surveys on noise pollution in different cities across the world have been conducted (4-10). As per the census (2011), the decadal growth of the urban population of India has risen to 31.8% during the last decade (2001-2011). Noise of a high intensity volume may cause either temporary or permanent damage to our hearing. The sciences behind these injuries are well understood. It is harmful not only to the behaviour, well-being and health of human but it also adversely affects the behaviour and habitat of animals [11]. The effect of sound on human and animals depends upon its frequency. Noise pollution is growing rapidly in urban areas due to sustained expansion in infrastructure development like industries, highways, rail networks and traffic, which are major sources of noise in urban areas. Indiscriminate use of vehicular horns and extensive use of loud speakers and disc jockey (DJ) sounds in Indian social and religious ceremonies pose various health hazards to the human being. Its effects depend not only on the intensity, but also on duration of exposure, frequency and the type of noise (12). The growth in noise pollution is unsustainable because it involves direct, as well as indirect, cumulative, adverse health effects (13). It not only curbs in communication and behaviour, but it may also leads to high blood pressure (14), sleeplessness, reduced productivity, cardiovascular defects, loss of concentration and malingering, hearing defects and cause fatigue (15). Traffic is one of the major contributors to the noise pollution in the city and chiefly affects the health of the residents of Bikaner. Due to alarming increase in noise pollution, its standards for permissible level for different areas have been given by the Central Pollution Control Board (Table 1). These standards in has been laid down under the Environment (Protection) Act, 1986. Silence zone is referred as areas up to 100 meters around such premises as hospitals, educational institutions and courts. The Silence zones are declared by the Competent Authority. Use of vehicular horns, loudspeakers and bursting of crackers are banned in these zones. Noise prevention and control is important as noise adversely affects us in several ways (16). The environment with lesser noise may uplift the working efficiency of a person (17). Therefore, the major objectives of the present investigation are to find out the status of noise pollution in the Bikaner and to suggest possible effective noise control measures for the city.

MATERIALS AND METHODS

The present study was carried out for assessment of the noise pollution at different locations of Bikaner city. The present investigation was done by using the Digital sound level meter (Smart Tools Co.) software on smart phone. Noise recordings were observed in dB (A) scale at every 30 second interval (i.e. 2 counts per minute) on each occasion of sampling. The monitoring of noise level was observed from 8:00 am to 10:00 am (for day time) and 8:00 pm to 10:00 pm (for night time) on the interval of a fortnight duration for the span of 3 months from February, 2016 to April, 2016 by following standard method (18) with some modifications. A total five sites were selected for the present investigation. The sampling sites were selected by keeping in mind about traffic load, industrial, commercial activities and proximity to major hospital, educational, judicial setups etc. The sites selected for the study were Karni Industrial area (as industrial site), Kot gate and Poogal fanta (both as commercial sites), JNV colony (as residential site) and PBM Hospital (as silence zone).

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Table 1: Standards for Noise level in different area*

Area Code	Category of Area	Limits in dB	
		Day time	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

*Source: Environment (Protection) Act, 1986 as amended in 2002

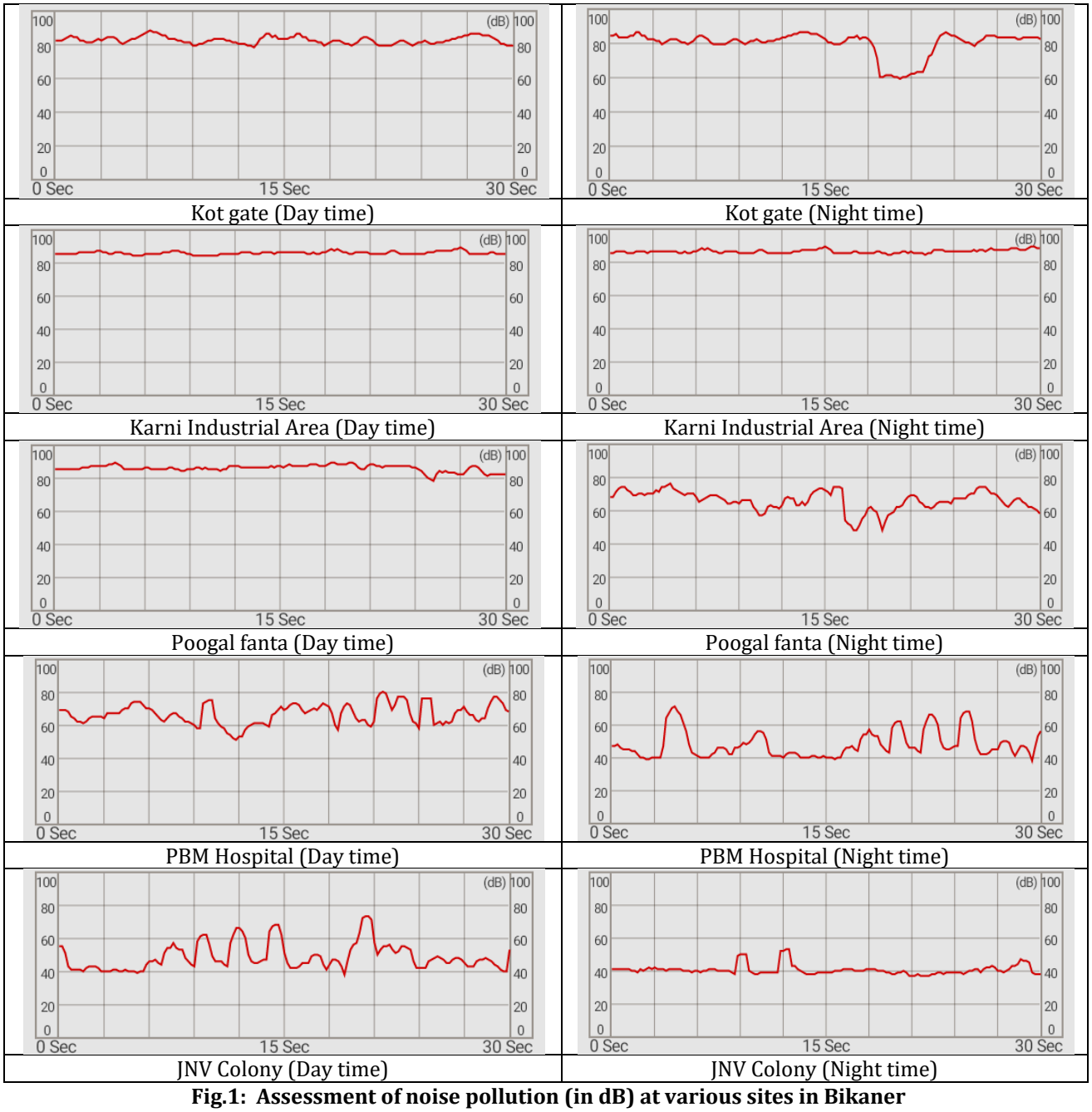

Fig.1: Assessment of noise pollution (in dB) at various sites in Bikaner

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Table-1: Comparative assessment of Noise level at various selected sites and the prescribed level

Location	Time	Noise level (dB)						Average noise level (dB)	Maximum permissible level (dB)
		01.02.16	15.02.16	01.03.16	15.03.16	01.04.16	15.04.16		
Kot gate (Commercial area)	8:00AM to 10:00 AM	87	88	84	82	89	81	85.17	65
	8:00PM to 10:00 PM	78	75	79	77	87	84	80.00	55
Karni Industrial Area	8:00AM to 10:00 AM	88	90	91	89	84	83	87.50	75
	8:00PM to 10:00 PM	87	86	86	88	85	87	86.50	70
PBM Hospital (Silence Zone)	8:00AM to 10:00 AM	58	63	63	64	69	53	61.67	50
	8:00PM to 10:00 PM	44	49	58	52	52	49	50.67	40
JNV Colony (Residential area)	8:00AM to 10:00 AM	56	54	58	60	59	55	57.00	55
	8:00PM to 10:00 PM	39	44	45	44	46	42	43.33	45
Poogal Fanta (Commercial area)	8:00AM to 10:00 AM	80	81	78	74	76	76	77.50	65
	8:00PM to 10:00 PM	67	62	58	61	59	62	61.50	55

Study area

Bikaner city is located in the north-western part of Rajasthan and encompassed between north latitudes 28.02° N and east longitudes 73.3° E. The city is having about 644,406 inhabitants as per the Census, 2011. The region experiences arid type of climate with mean annual rainfall (1971-2005) 297.7 mm whereas normal rainfall (1901-1971) is lower than average rainfall and placed at 257.8 mm. Almost 90% of the total annual rainfall is received during the southwest monsoon, which enters the district in the first week of July and withdraws in the mid of September. As Bikaner lies in the desert area, extreme of heat in summer and cold in winter is the characteristic of the desert. The temperature varies from 48°C in summer to 1°C in winter. Atmosphere is generally dry except during the monsoon period. The humidity is highest in August with mean daily relative humidity is 71% in the morning and 52% in the evening.

RESULTS AND DISCUSSION

The results of the present investigation revealed that the noise level in Bikaner city is extremely high from the prescribed level (Table-2). Among all the selected sites the level of noise was highest in Karni industrial area followed by Kotgate, Poogal fanta, PBM hospital and JNV colony, respectively (Fig.1). It was important to notice that the PBM (silence zone) the noise level site was significantly high, which might be due to the location of PBM hospital at the verge of the National Highway 89. The results of the study are supported by research carried out by many authors who pointed out the existence of association between the sound levels measured in urban location and the road traffic volume flowing by that location (19-21). The PBM hospital is biggest hospital of the division and the rush of ambulances with siren horn create significant noise at the site. The results of the study are in correlation with the earlier findings (22,23). It was reported that the average noise level for day time sampling was found in order of Karni industrial area (87.50 dB) > Kot gate (85.17 dB) > Poogal fanta (77.50 dB) > PBM hospital (61.67dB) > JNV colony (57.00 dB), while during night time, the average noise level at different sampling sites were reported in order of Karni industrial area (86.50 dB) > Kot gate (80.00 dB) > Poogal fanta (61.50 dB) > PBM hospital (50.67dB) > JNV colony (43.33 dB). Comparative assessment of noise level at various selected sites and the prescribed level shows that most of the areas of Bikaner are not fit for the noise point of view. The results of the study depicted that almost all the observations for noise level assessment at Kot gate, Karni Industrial area, PBM hospital and Poogal fanta were exceeded from its prescribed maximum permissible limits. However, at JNV site, the results for noise level during night time were found under the maximum permissible limits which might be due to reduced traffic at night time in residential areas. Similar observations were reported in earlier study which accounted that increasing transportation demands, population blast, increase in number and types of vehicles and congestion of traffic on roads are factors that have intensified noise pollution in urban area (24).

To mitigate the ill effects of noise pollution, the sources of noise must be identified and sincere action must be taken to combat with its adverse effects. Some of the measures for controlling the noise pollutions include issuing the licenses to parties intending to use loudspeakers or public address system for any occasion, loudspeakers should not be allowed for advertisement and commercial activities, use of equipment like earmuffs, ear plugs for workers exposed to high level of noises etc. Strict enforcement of existing law to prohibit air horns inside the city, plantation of trees, laying good roads and their maintenance, proper maintenance of the vehicles, isolation of highly noise producing machines, educating people about effects of noise pollution etc are key factors which must be taken in consideration to mitigate the urban noise pollution.

CONCLUSION

Present study reveals important information pertaining to the exposure of noise to the residents of Bikaner city. It was noticed that the noise level at almost all the sampling sites has crossed the maximum permissible limits. Thus, the residents, workers and other persons, who is exposed to such noisy environment may adversely affected from physical, mental and social health point of view. Therefore, it is the need of the time to take an immediate action by the policy makers and the governments to frame and implement effective plans to curb the adverse effects of noise in order to ensure health, safety and to enhance efficiency and comfort of the residents of the area.

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